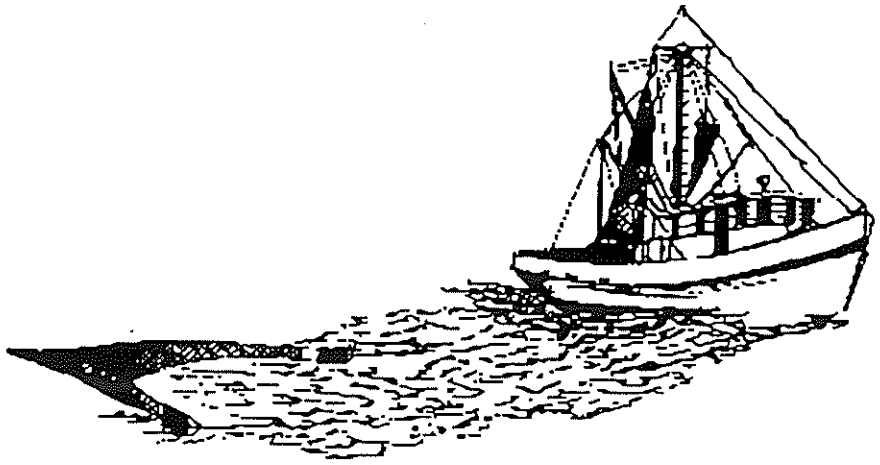
SPECIAL REPORT

Louisiana Debris Study



GALVESTON LABORATORY

SOUTHEAST FISHERIES SCIENCE CENTER

NATIONAL MARINE FISHERIES SERVICE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

DEPARTMENT OF COMMERCE

OCTOBER 1992

INTRODUCTION

When Hurricane Andrew hit the coastal areas of central Louisiana on August 26, 1992, tidal flooding and coastal runoff reportedly washed massive amounts of debris into the inshore and nearshore waters in the affected area. Because of this subtidal debris, a Turtle Excluder Device (TED) free zone, from 89°25' W. longitude to 93° W. longitude extending 15 nautical miles offshore, was established to allow fishermen to trawl for shrimp without the debris clogging their TEDs. The functioning National Marine Fisheries Service's (NMFS) onboard bycatch characterization observer program was employed by the NMFS Southeast Regional Office to document the amount of debris in the area on a daily basis. This information was gathered to determine when debris amounts in the zone were reduced to the point where TEDs could again be pulled by shrimp vessels fishing in the area.

Background to Bycatch Characterization Program

In response to congressional requirements imposed pursuant to 1990 Amendments to the Magnuson Fishery Conservation and Management Act (Magnuson Act) the NMFS entered into a cooperative agreement with the Gulf and South Atlantic Fisheries Development Foundation, Inc. (Foundation) to develop and implement a research program for evaluating management options to address shrimp trawl bycatch in the Gulf of Mexico and South Atlantic. Ongoing bycatch research follows the guidelines outlined in the Research Plan Addressing Finfish Bycatch in the Gulf of Mexico and South Atlantic Shrimp Fisheries, prepared by the Foundation under the direction of a Steering Committee composed of individuals representing industry, environmental, State and Federal interests. One of the major objectives of this research is the characterization of shrimp trawl bycatch.

Onboard data collection for the purpose of bycatch characterization consists of sampling trawl catches taken from commercial shrimp vessels operating in the U.S. Gulf of Mexico and U.S. South Atlantic. Allocation of sampling effort is stratified by location, season and depth. Data relevant to species composition, abundance and life history are collected by onboard observers. Detailed data collection procedures are contained in the NMFS Bycatch Characterization Sampling Protocol and are summarized in a later section in this report.

Training for Bycatch Characterization Observers

Through a cooperative effort, the NMFS and the Foundation have implemented an onboard observer program to collect bycatch data. The program is divided into two divisions: NMFS (coordinated by the NMFS Galveston Laboratory), and non-NMFS (coordinated by the Foundation). All observers, whether funded by NMFS or through the Foundation, are required to collect data following the established NMFS sampling protocol. All observers collecting characterization data have obtained a Bachelor of Science Degree in Marine Biology or a related field. Training on species identification, vessel etiquette, safety, and sampling protocol has been provided to all observers (NMFS and non-NMFS) during a 5 to 7 day training session taught by NMFS and Texas A&M University.

Vessel Location for Bycatch Characterization Research

This program is based strictly on voluntary participation by industry. Given the importance of this program, it is essential that many different vessels participate in this research effort. The greater the number of vessels, the greater the reduction in the statistical bias due to vessel differences. The Foundation has the formal responsibility of locating vessel owners/captains willing to participate in the bycatch characterization study. NMFS, with its current port agent trip interview program, has also been successful in soliciting participation by industry. Quality work done by the observers, while on vessels, has prompted other vessel owners to participate. Once a fisherman expresses interest in taking an observer onboard his vessel, he is then contacted either by the NMFS coordinator or by the Foundation coordinator (depending on observer availability). Project objectives, sampling procedure, and data confidentiality are discussed with the owner/captain during the initial stages of scheduling a trip and are later reviewed by the observer to ensure clarification prior to making a trip.

MATERIALS AND METHODS

Bycatch Data Collection Methods (As discussed with the vessel owner)

GENERAL STATION DATA:

At each trawl location general information is recorded by the observer. This information includes station number, vessel speed, tow time, location (latitude and longitude), and any problems with the gear.

PROCESSING THE CATCH:

Each net on the vessel is assigned a specific number. The numerical sequence on a quad-rigged vessel is 1 - outside port, 2 - inside port, 3 - inside starboard, or 4 - outside starboard. After each trawl one net is randomly selected for sampling. Total catch from the selected net is placed in baskets and weighed to obtain a total weight.

A sample not exceeding 12 kilograms (26 pounds) per hour towed is taken and processed. Shrimp are sorted and processed first, then immediately returned to the crew. Fish and invertebrates are identified to species level, counted and weighed. Thirty specimens from each species group are measured.

If a positive identification of a specimen can not be made, the organism is either photographed, preserved, or bagged and placed in the freezer or ice hold.

NET MEASUREMENTS:

Several detailed measurements are taken on all four of the trawls before they are placed into the water. Any adjustments that are made during the trip are recorded. The intent here is to see if particular net or gear design is more efficient than another (cleaner catches).

ECONOMIC DATA:

Information on cost of fuel, oil, ice and food, etc., is collected if made available by the Captain.

DATA SHEETS:

Captains are required to sign the data sheets to verify that the information was collected. Copies of the completed station data sheets are made available on site, if possible, or mailed to the vessel Captain. All individual vessel data are confidential. Once data are pooled (i.e., where no individual vessels can be identified) it is made available for distribution.

FOOD AND INSURANCE:

The observer's organization is responsible for the cost of the observer's food while he is aboard the vessel ($25 per day, to be paid to the Captain upon completion of the trip). Vessel liability insurance is provided ($250,000 coverage).

General Instructions to NMFS Bycatch Observers; Interface with Industry

1. Observers are representatives of the U.S. Government, Department of Commerce, National Marine Fisheries Service (NMFS), Southeast Fisheries Science Center, Galveston Laboratory.

2. Observers will conduct themselves in a professional manner at all times.

3. Observers will not say or do anything that will reflect negatively on NMFS.

4. Observers will not offer personal opinions when they can be misconstrued as the opinion of NMFS, for example, voicing an opinion on TEDs or BRDs. Observers are instructed to think before they speak or act.

5. Observers should remember that they are guests aboard the vessels; the owners and/or captains are voluntarily allowing them onboard.

6. The sampling protocol will be explained to the captain prior to departure. If for some reason while on the trip, the captain will not follow the sampling design, record on the data sheets when and what problems occurred, collect as much data as possible, and depart vessel as soon as it lands at a port. Supervisors are to be notified as soon as possible.

7. Individual boat captains will be sent copies of data sheets relevant to data collected on their vessel. When all data from numerous vessels are pooled, it will be made available for distribution. This prevents disclosing individual information. Discussions with boat captains or deckhands about what other boat captains are doing, no matter how insignificant it might seem, are not permitted.

8. Most of the vessels participating in this project have been referred by the Foundation or NMFS port agents, and have been regarded as "safe." If serious safety problems are evident, and safety or health could be jeopardized, the observer will not board the vessel. If aboard the vessel and threats to safety or health arise, the observer will depart the vessel as soon as it returns to any port. Supervisors are to be notified immediately.

9. The objective of this project is to collect and report scientifically sound biological data. If the TEDs are modified or removed, the appropriate code is entered on your data sheets. This will not be used for enforcement purposes; this simply prevents biasing the data.

10. Observers call in every Friday morning between 0800 and 1200 via cellular phone or marine operator. They do not disclose sensitive data over the phone.

11. The boat captain is paid $25 a day (any part of a day constitutes a day) at the end of a trip. The observer gets the signed receipt.

Specific Instructions for Louisiana Debris Observations

On September 2, 1992, the NMFS Regional Office requested that all observers collecting characterization data on vessels off the coast of Louisiana call in debris data (as percentage of total catch). These instructions were given to the observers, and vessel captains were told that the debris data was going to be recorded by the observer. If the vessel captain did not want to participate, debris data would not be collected, only characterization data. Observers and vessel captains were told that these collected data would be released in a manner that would not identify individual vessels. A list of Franklin, Louisiana vessel owners was sent to the NMFS coordinator by the Louisiana Department of Wildlife and Fisheries. These owners were contacted by the NMFS coordinator, and the bycatch characterization project objectives and procedures were explained. Again, debris data collection was not the primary focus of the data collection. Once on vessels, the observers followed bycatch characterization sampling procedures as listed above. Visual observations of percent debris within the total catch were recorded for each trawl. Latitude and longitude coordinates and percent debris by tow were sent to the NMFS Regional Office along with the weekly progress report on bycatch characterization activity.

RESULTS and DISCUSSION

General Information

A total of 150 tows, over a 30-day period (September 6 through October 5, 1992), were observed in the Louisiana area west of the Mississippi River during the TED exemption period (Table 1). Of these 150 tows, 126 were in the TED exemption area, 4 were inshore of the exemption

area, and 20 were offshore of the exemption area. All of the 150 tows had debris information results recorded. However, tow times were recorded only for the 131 tows that were collected by NMFS observers as part of the bycatch characterization program. For the other 19 tows that tow duration was not recorded, individuals from Louisiana Department of Wildlife and Fisheries boarded vessels and collected location and debris data from 4 tows, and individuals from the U.S. Coast Guard gathered location and debris data on 15 tows during enforcement operations in the TED exemption area. Neither the Louisiana Department of Wildlife and Fisheries or the U.S. Coast Guard were collecting bycatch characterization data or using the NMFS bycatch characterization protocol.

The information from the 150 tows was obtained from a total of 24 shrimp vessels fishing in the Louisiana area. NMFS observers were on shrimp vessels home ported in either Texas, Louisiana or Alabama. It is unknown what the home states were for the shrimp vessels boarded by individuals from the U.S. Coast Guard and the Louisiana Department of Wildlife and Fisheries.

Debris Data

Weekly summaries of percent debris by tow can be found in Table 1 and on maps located in Appendix 1. All the observed tows offshore from the TED exemption area had no hurricane-related debris clogged in the nets (data collected during the September 13 through October 3, 1992 period). Of the four tows examined inshore of the TED exemption area (data collected during the September 20 through September 26, 1992 period), only one had debris associated with it (25% of the catch).

During week one of the debris study (September 6 through September 12, 1992) a total of 11 tows were observed in the TED exemption area. All of these tows occurred west of Point au Fer Island at the opening into Atchafalaya Bay, Louisiana. Six of these tows had no hurricane-associated debris in the nets, two of the tows had between 1% and 25% debris in the nets, one tow had between 26% and 50% debris in the nets, while the nets in the last two tows had between 51% and 75% debris. The mean debris content was 17.7% with a standard error of 8.2% (Figure 1). During week two of the debris study (September 13 through September 19, 1992) a total of 20 tows were observed in the TED exemption area. All of these tows occurred either west of Point au Fer Island at the opening into Atchafalaya Bay, Louisiana, or just south of Point au Fer Island, Louisiana. Four of these tows had no hurricane-associated debris in the nets, two of the tows had between 1% and 25% debris in the nets, and two tows had between 26% and

50% debris in the nets. The nets in the last twelve tows had between 51% and 75% debris. The mean debris content was 50.0% with a standard error of 7.2% (Figure 1). During week three of the debris study (September 20 through September 26, 1992) a total of 46 tows were observed in the TED exemption area. These tows occurred all along the coast of Louisiana, west of the Mississippi River. The majority of these tows (34) had no hurricane-associated debris in the nets. Two of the tows had between 1% and 25% debris in the nets, and three tows had between 26% and 50% debris in the nets. The last seven tows had between 51% and 75% debris in the nets. The mean debris content was 14.4% with a standard error of 4.1% (Figure 1). During week four of the debris study (September 27 through October 3, 1992) a total of 43 tows were observed in the TED exemption area. These tows occurred all along the coast of Louisiana, with most west of Point au Fer Island at the opening into Atchafalaya Bay, Louisiana. A majority of these tows (39) had no hurricane-associated debris in the nets. The other four tows had between 26% and 50% debris in the nets. The mean debris content was 4.7% with a standard error of 2.2% (Figure 1). During the final few days of the debris study (October 4 through October 5, 1992) a total of 6 tows were observed in the TED exemption area. These tows occurred west of Point au Fer Island at the opening into Atchafalaya Bay, Louisiana. All of these tows had no hurricane-associated debris in the nets. Thus, the mean debris content was 0.0% with a standard error of 0.0% (Figure 1).

It is interesting to note the decrease in percent debris from week 2 to week 5 (Figure 1). It is not known why debris percentage during week one was less than week two, unless debris was still being moved from the inshore areas to the nearshore areas during that time period. A frequency histogram plot of the total debris data shows that the majority (70%) of the tows had no debris in the nets, with tows having 75% and 50% debris showing the next greatest frequencies (Figure 2).

Tow Time Data

Tow time data are collected during the bycatch characterization study to calculate catch per unit effort values for the various finfish and invertebrate species taken as bycatch during shrimping activity. Times for 109 tows were taken in the TED exempt area during the study. Ten tows were from vessels pulling TEDs; times from these tows were not included in the analysis. Therefore only a total of 99 tows were involved in the tow time analysis. Average tow time during the first week of the study was 4.1 hours with a standard error of 0.1 hours. This was the longest average time for the entire five week period (Figure 3). Week two had the shortest average tow time (1.8 hours, with standard error of 0.2). Tow times increased from week

two until week five when the average tow time was 3.6 hours with a standard error of 0.4 (Figure 3). It initially appears from the data that as percentage debris decreased tow time increased (compare Figure 1 and Figure 3). Regression analysis resulted in a r-square value of 0.14. Figure 4 clearly shows that there is little relationship between tow time and percent debris on a tow-by-tow basis.

A frequency histogram plot of the tow time data shows that most often tows had a duration of between 4 and 4.5 hours (about 22%; Figure 5). The second most frequent tow duration was 2 to 2.5 hours, closely followed by tow time durations of 1 to 1.5 hours and 3.5 to 4 hours. No tows were greater than 5.5 hours in total duration.

Enforcement Data

During the third week of the debris study (September 20 through September 26, 1992) the U.S. Coast Guard had a major push to enforce the regulations in the TED exemption area. A total of 15 vessels were observed and boarded during this enforcement effort (see violation map in Appendix 1). Ten of the 15 vessels were in compliance with all regulations and received no citations. The other five vessels were in violation of specific laws and citations were issued by the U.S. Coast Guard. One of the vessels was cited for tow time violation, one vessel was cited for pulling an non-certified TED and the other three vessels were issued tickets for both tow time violations and non-registration of the vessel.

Sea Turtle Data

Two dead Kemp's ridley sea turtles were found in two of the characterization tows taken in the TED exemption area. The first turtle was obtained during a 2.25-hour tow in nine feet of water on September 23, 1992. It had a straight length measurement of 56 cm and a weight of 22.6 kg. No external tags were present. A 10 to 15 cm gash was observed across the dorsal surface of the shell. The second Kemp's ridley sea turtle was obtained during a 4 hour tow in thirteen feet of water on October 1, 1992. It had a straight length measurement of 32 cm and a weight of 5.6 kg. No external tags were present. The sea turtle was held on deck for 4 hours, but did not revive during that time period.

On October 5, 1992, a dead sea turtle (species unknown) was sighted floating in the vicinity of a menhaden fishing vessel. At the time of the sighting the vessel was in shoal waters at a depth of about 7 feet and was in the process of hauling aboard its purse seine. Shrimping operations were

sparse in the immediate area and few shrimp vessels were seen on the horizon.

Table 1. Louisiana debris data by weeks.

Week	Latitude	Longitude	Percent Debris	Data Collection	Exemption Area
1	2919.10	9130.15	50	NMFS Galveston	YES
1	2923.62	9137.80	50	NMFS Galveston	YES
1	2919.41	9129.95	0	NMFS Galveston	YES
1	2921.35	9141.32	0	NMFS Galveston	YES
1	2920.37	9147.29	0	NMFS Galveston	YES
1	2916.76	9136.38	0	NMFS Galveston	YES
1	2913.89	9136.23	0	NMFS Galveston	YES
1	2915.67	9130.99	10	NMFS Galveston	YES
1	2913.85	9134.46	10	NMFS Galveston	YES
1	2921.05	9133.34	75	NMFS Galveston	YES
1	2920.43	9132.93	0	NMFS Galveston	YES
2	2917.87	9134.05	0	NMFS Galveston	YES
2	2920.07	9132.07	0	NMFS Galveston	YES
2	2916.50	9130.06	10	NMFS Galveston	YES
2	2916.12	9127.28	75	NMFS Galveston	YES
2	2918.00	9123.93	75	NMFS Galveston	YES
2	2916.27	9121.84	75	NMFS Galveston	YES
2	2917.85	9122.75	75	NMFS Galveston	YES
2	2917.21	9124.60	75	NMFS Galveston	YES
2	2918.29	9123.11	75	NMFS Galveston	YES
2	2911.84	9115.65	0	NMFS Galveston	YES
2	2914.89	9121.57	15	NMFS Galveston	YES
2	2917.07	9122.03	50	NMFS Galveston	YES
2	2916.66	9122.30	75	NMFS Galveston	YES
2	2917.34	9123.59	75	NMFS Galveston	YES
2	2919.14	9123.55	75	NMFS Galveston	YES
2	2917.77	9122.00	45	NMFS Galveston	YES
2	2915.35	9119.86	75	NMFS Galveston	YES
2	2916.26	9123.42	75	NMFS Galveston	YES
2	2914.13	9120.62	55	NMFS Galveston	YES
2	2910.49	9111.15	0	NMFS Galveston	YES
2	2849.01	8948.55	0	NMFS Galveston	NO
2	2847.51	8952.37	0	NMFS Galveston	NO
3	2908.57	9102.50	75	NMFS Galveston	YES
3	2910.08	9110.10	10	NMFS Galveston	YES
3	2912.56	9118.07	0	NMFS Galveston	YES
3	2913.19	9116.37	0	NMFS Galveston	YES
3	2911.08	9112.02	75	NMFS Galveston	YES
3	2910.04	9105.08	75	NMFS Galveston	YES
3	2908.37	9102.58	0	NMFS Galveston	YES
3	2908.25	9105.06	75	NMFS Galveston	YES
3	2909.38	9108.57	35	NMFS Galveston	YES
3	2909.17	9105.31	10	NMFS Galveston	YES
3	2908.18	9112.20	0	NMFS Galveston	YES

Table 1. Louisiana debris data by weeks (continued).

Week	Latitude	Longitude	Percent Debris	Data Collection	Exemption Area
3	2908.56	9111.44	0	NMFS Galveston	YES
3	2908.40	9113.35	0	NMFS Galveston	YES
3	2908.32	9111.43	75	NMFS Galveston	YES
3	2907.40	9111.25	0	NMFS Galveston	YES
3	2910.23	9117.13	0	NMFS Galveston	YES
3	2905.50	9122.14	0	NMFS Galveston	YES
3	2910.04	9121.10	0	NMFS Galveston	YES
3	2847.00	8954.63	0	NMFS Galveston	NO
3	2847.47	8953.88	0	NMFS Galveston	NO
3	2845.26	9001.55	0	NMFS Galveston	NO
3	2844.94	9000.87	0	NMFS Galveston	NO
3	2846.15	8954.23	0	NMFS Galveston	NO
3	2843.33	9004.03	0	NMFS Galveston	NO
3	2845.14	8958.41	0	NMFS Galveston	NO
3	2845.28	8958.44	0	NMFS Galveston	NO
3	2845.39	9002.29	0	NMFS Galveston	NO
3	2859.10	9024.22	0	NMFS Galveston	YES
3	2857.46	9026.58	0	NMFS Galveston	YES
3	2857.73	9024.57	0	NMFS Galveston	YES
3	2857.60	9027.30	0	NMFS Galveston	YES
3	2851.91	9025.40	0	NMFS Galveston	YES
3	2857.18	9024.52	0	NMFS Galveston	YES
3	2854.21	9014.67	0	NMFS Galveston	YES
3	2852.82	9016.32	0	NMFS Galveston	YES
3	2901.23	9003.34	0	NMFS Galveston	YES
3	2836.37	9201.53	0	NMFS Galveston	NO
3	2847.24	9151.36	0	NMFS Galveston	NO
3	2944.45	9152.81	25	NMFS Galveston	NO
3	2945.16	9153.59	0	NMFS Galveston	NO
3	2901.27	9033.47	0	NMFS Galveston	YES
3	2900.98	9032.72	0	NMFS Galveston	YES
3	2900.00	9100.00	50	Louisiana Wildlife	YES
3	2910.00	9110.00	50	Louisiana Wildlife	YES
3	2915.00	8958.00	75	Louisiana Wildlife	YES
3	2917.00	8956.00	60	Louisiana Wildlife	YES
3	2911.50	9124.20	0	Enforcement	YES
3	2912.50	9021.30	0	Enforcement	NO
3	2910.50	9020.40	0	Enforcement	NO
3	2911.50	9124.20	0	Enforcement	YES
3	2907.60	8956.60	0	Enforcement	YES
3	2907.50	8956.30	0	Enforcement	YES
3	2915.20	8955.30	0	Enforcement	YES
3	2911.00	8957.40	0	Enforcement	YES
3	2920.00	9231.83	0	Enforcement	YES

Table 1. Louisiana debris data by weeks (continued).

Week	Latitude	Longitude	Percent Debris	Data Collection	Exemption Area
3	2936.16	9246.47	0	Enforcement	YES
3	2937.10	9248.10	0	Enforcement	YES
3	2936.84	9245.90	0	Enforcement	YES
3	2856.91	9045.70	0	Enforcement	YES
3	2856.70	9014.20	0	Enforcement	YES
3	2921.76	9238.47	0	Enforcement	YES
4	2910.04	9119.07	0	NMFS Galveston	YES
4	2914.44	9130.15	0	NMFS Galveston	YES
4	2919.21	9138.04	0	NMFS Galveston	YES
4	2918.32	9139.59	0	NMFS Galveston	YES
4	2919.74	9140.94	0	NMFS Galveston	YES
4	2922.41	9137.27	0	NMFS Galveston	YES
4	2922.95	9138.70	0	NMFS Galveston	YES
4	2922.11	9138.50	0	NMFS Galveston	YES
4	2921.28	9141.95	0	NMFS Galveston	YES
4	2920.08	9140.50	0	NMFS Galveston	YES
4	2915.42	9136.75	0	NMFS Galveston	YES
4	2921.71	9142.48	0	NMFS Galveston	YES
4	2921.63	9140.45	0	NMFS Galveston	YES
4	2920.96	9139.77	0	NMFS Galveston	YES
4	2921.82	9139.95	0	NMFS Galveston	YES
4	2921.71	9141.84	0	NMFS Galveston	YES
4	2901.58	9032.05	0	NMFS Galveston	YES
4	2859.93	9055.68	0	NMFS Galveston	YES
4	2902.52	9058.47	0	NMFS Galveston	YES
4	2918.20	9140.72	0	NMFS Galveston	YES
4	2918.63	9140.87	0	NMFS Galveston	YES
4	2923.67	9142.00	0	NMFS Galveston	YES
4	2924.36	9143.77	0	NMFS Galveston	YES
4	2922.58	9144.26	0	NMFS Galveston	YES
4	2919.75	9145.64	0	NMFS Galveston	YES
4	2918.67	9141.05	0	NMFS Galveston	YES
4	2918.20	9141.42	0	NMFS Galveston	YES
4	2917.43	9143.38	0	NMFS Galveston	YES
4	2914.73	9139.42	0	NMFS Galveston	YES
4	2915.48	9138.17	0	NMFS Galveston	YES
4	2915.70	9135.62	0	NMFS Galveston	YES
4	2919.18	9138.75	0	NMFS Galveston	YES
4	2922.80	9138.73	0	NMFS Galveston	YES
4	2923.07	9139.77	0	NMFS Galveston	YES
4	2922.82	9141.40	50	NMFS Galveston	YES
4	2923.33	9135.78	50	NMFS Galveston	YES
4	2924.60	9144.82	0	NMFS Galveston	YES
4	2922.07	9150.22	0	NMFS Galveston	YES

Table 1. Louisiana debris data by weeks (continued).

Week	Latitude	Longitude	Percent Debris	Data Collection	Exemption Area
4	2922.60	9151.04	0	NMFS Galveston	YES
4	2925.22	9155.27	50	NMFS Galveston	YES
4	2921.85	9154.00	50	NMFS Galveston	YES
4	2916.73	9136.55	0	NMFS Galveston	YES
4	2902.87	9128.42	0	NMFS Galveston	NO
4	2859.45	9018.64	0	NMFS Galveston	YES
4	2850.00	9158.52	0	NMFS Galveston	NO
4	2847.24	9151.36	0	NMFS Galveston	NO
4	2850.36	9225.29	0	NMFS Galveston	NO
4	2855.06	9227.04	0	NMFS Galveston	NO
4	2900.08	9235.39	0	NMFS Galveston	NO
4	2836.37	9201.53	0	NMFS Galveston	NO
5	2917.50	9135.60	0	NMFS Galveston	YES
5	2921.02	9140.75	0	NMFS Galveston	YES
5	2923.83	9142.72	0	NMFS Galveston	YES
5	2924.48	9146.37	0	NMFS Galveston	YES
5	2916.85	9137.18	0	NMFS Galveston	YES
5	2916.23	9136.53	0	NMFS Galveston	YES

Week 1= 9/6-9/12; Week 2 = 9/13-9/19; Week 3 = 9/20-9/26; Week 4 = 9/27-10/3; and Week 5 =10/4-10/5.

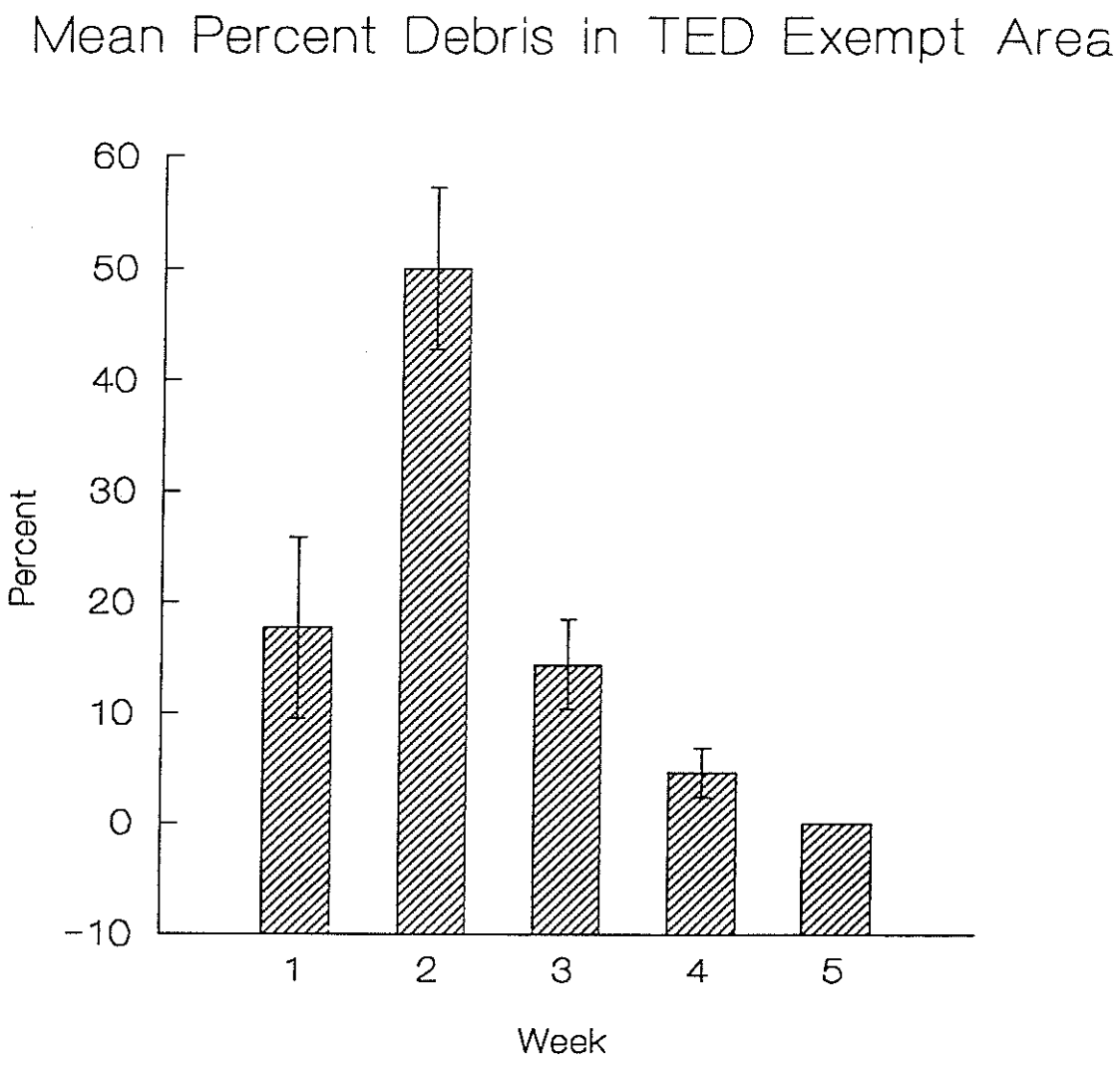


Figure 1. Average weekly debris for data collected in the TED exemption area off Louisiana.

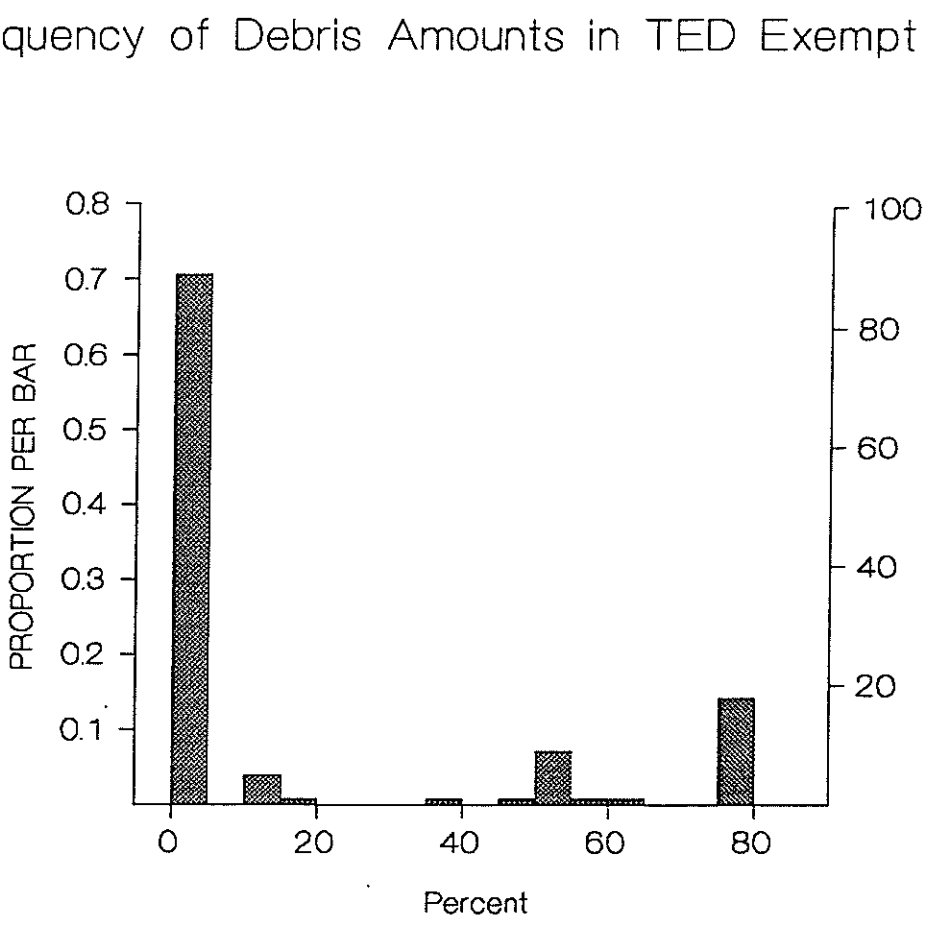


Figure 2. Frequency histogram of percent debris in TED exemption area.

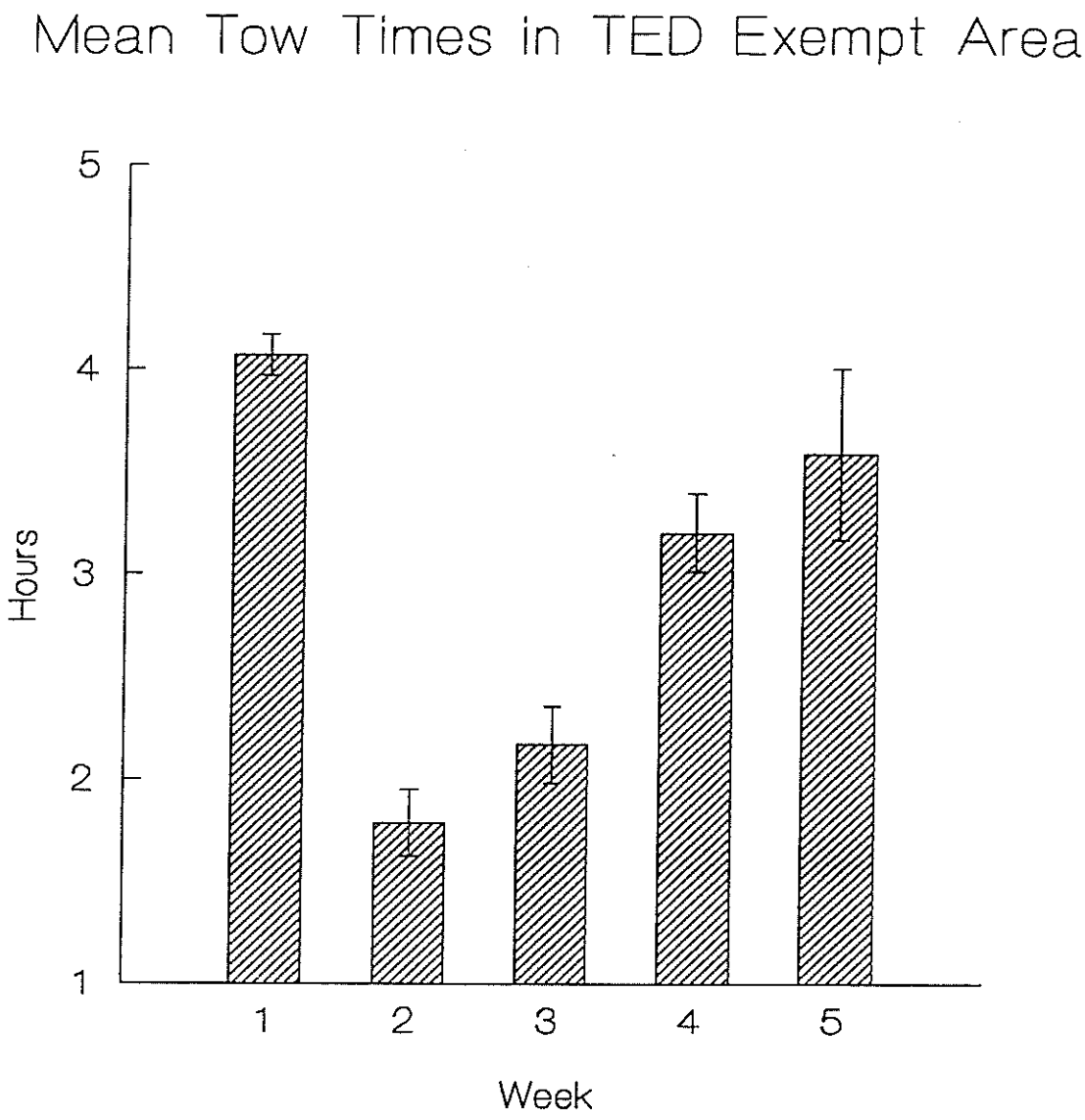


Figure 3. Average weekly tow times for data collected in the TED exemption area off Louisiana.

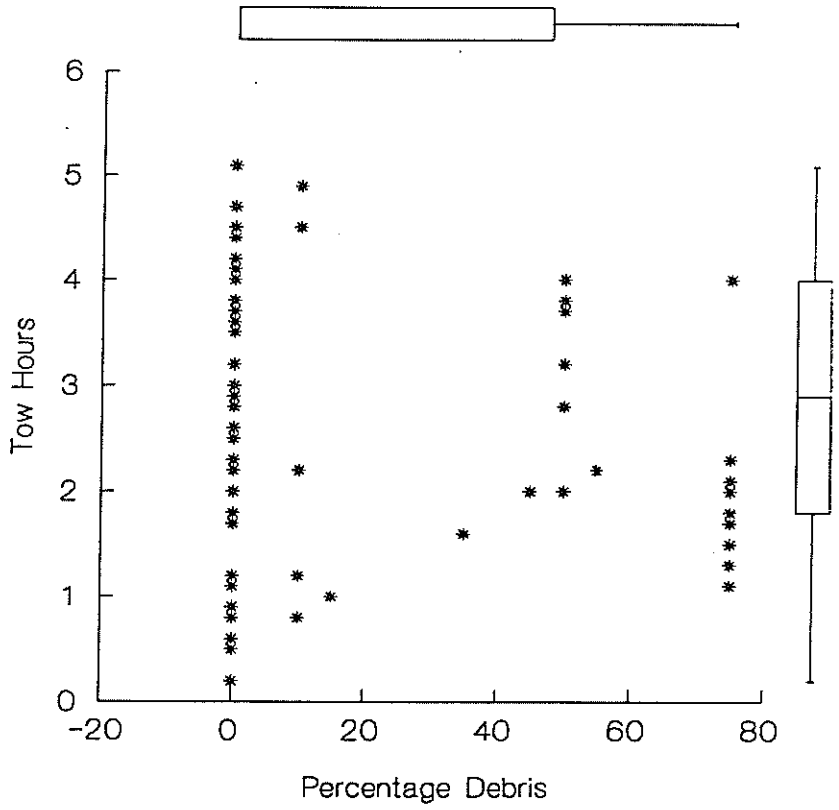


Figure 4. Scatter plot of tow times and percent debris for each tow in the TED exemption area (line in center of the box diagram is median).

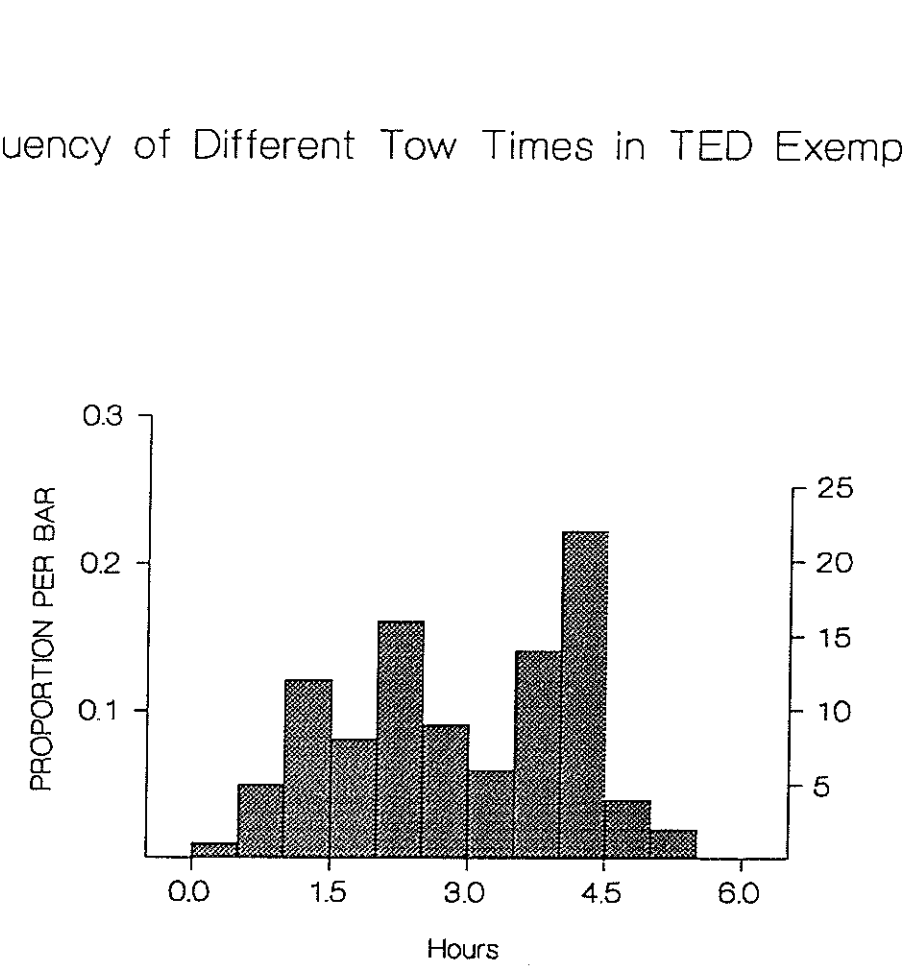
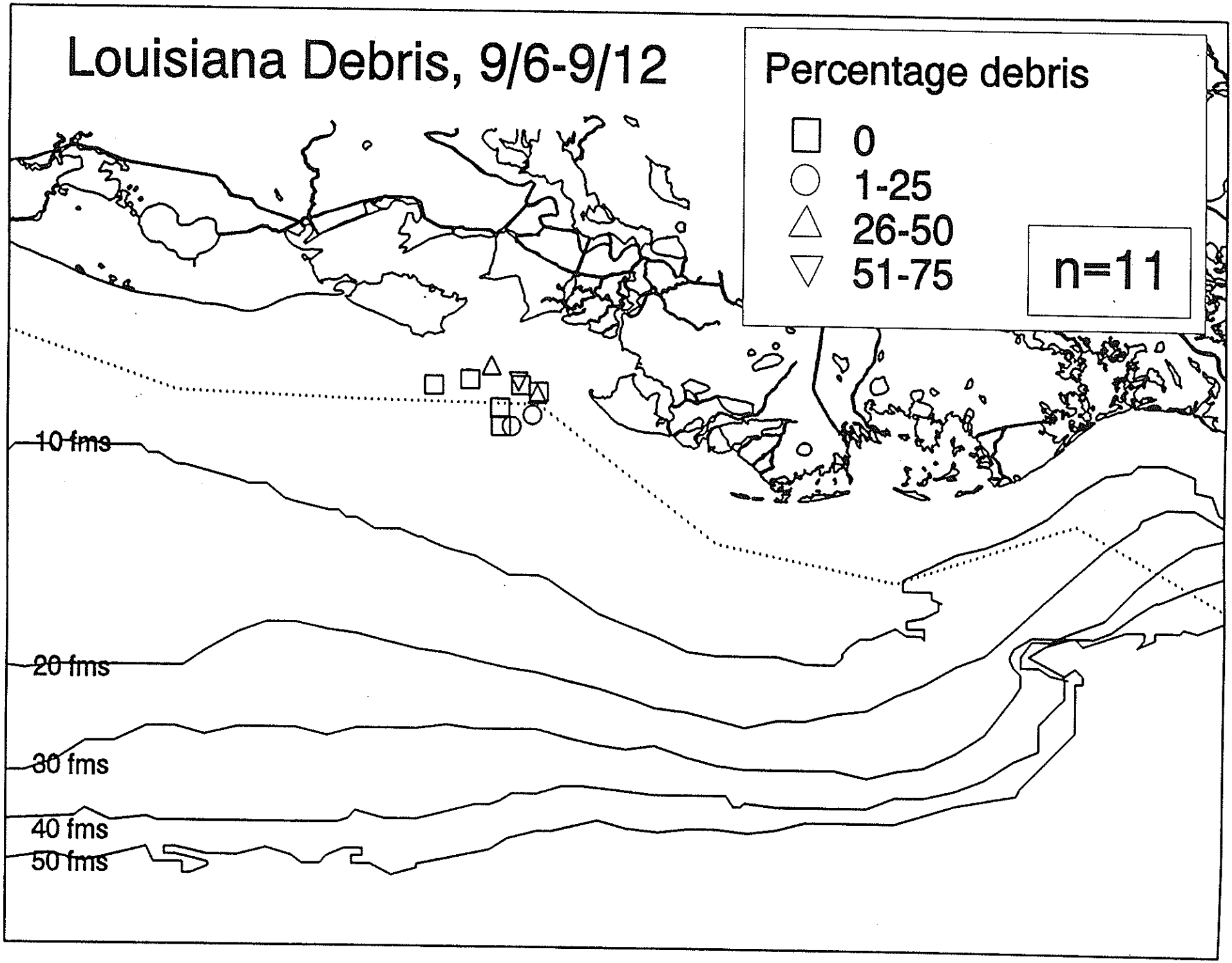
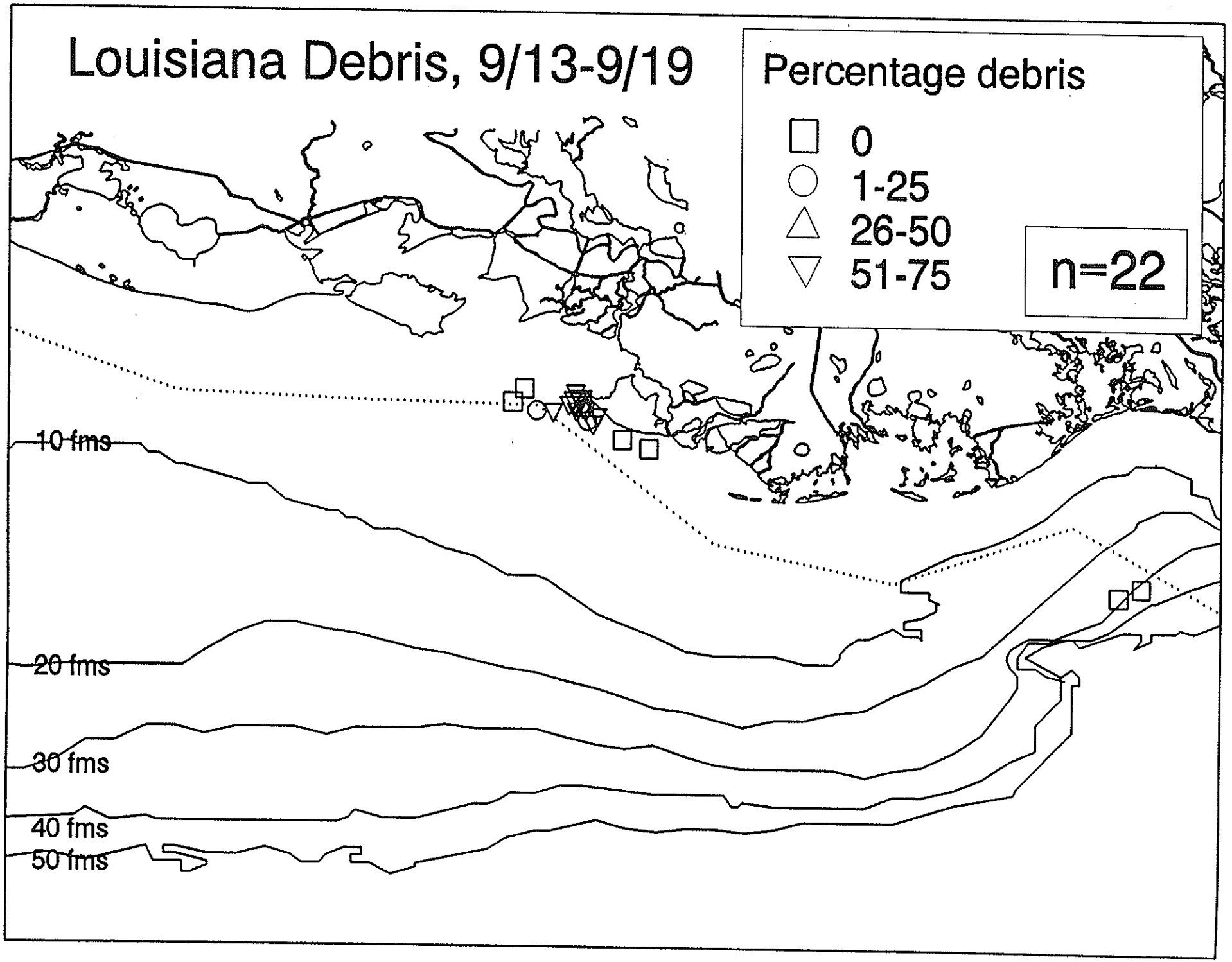


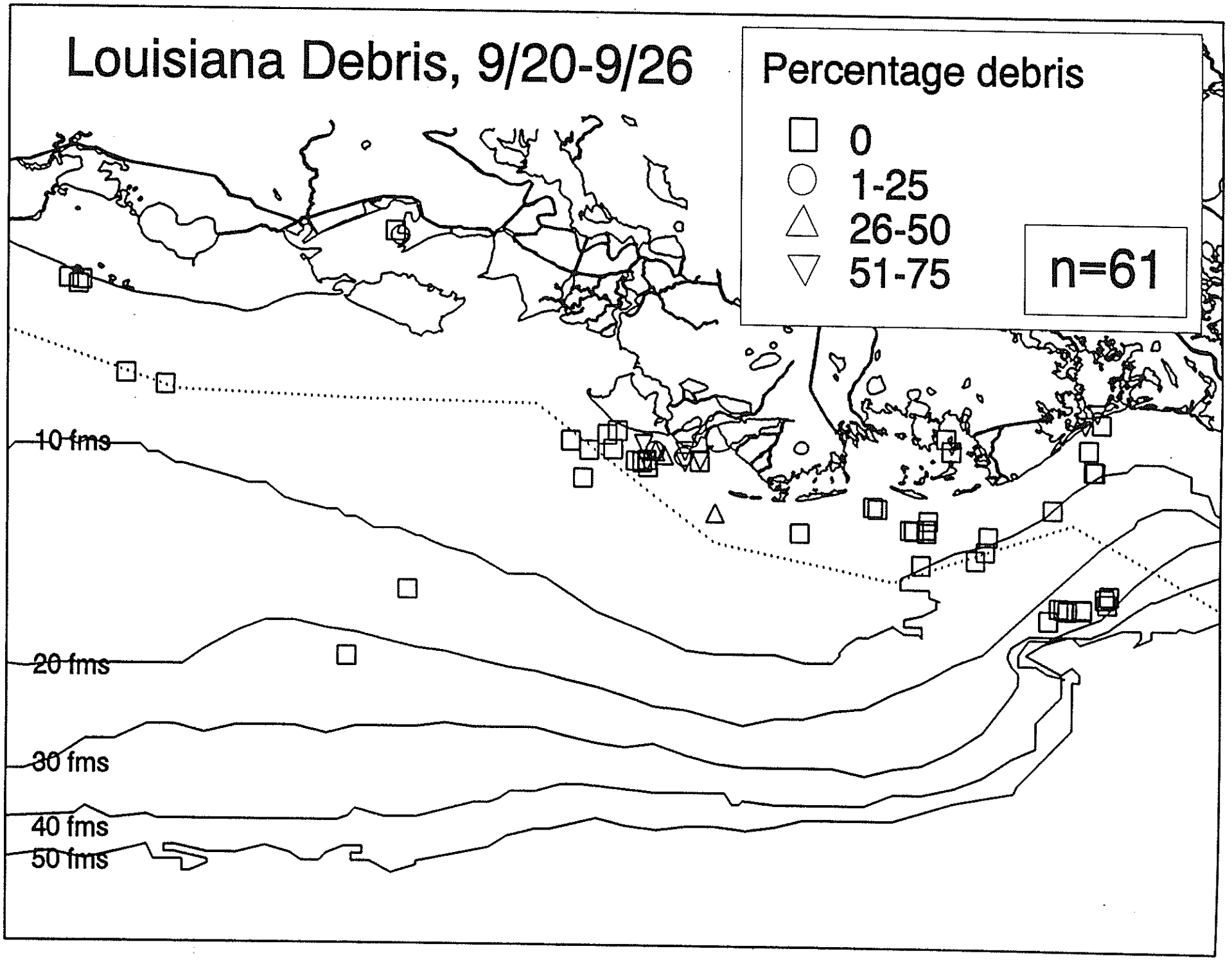
Figure 5. Frequency histogram of tow times in TED exemption area.

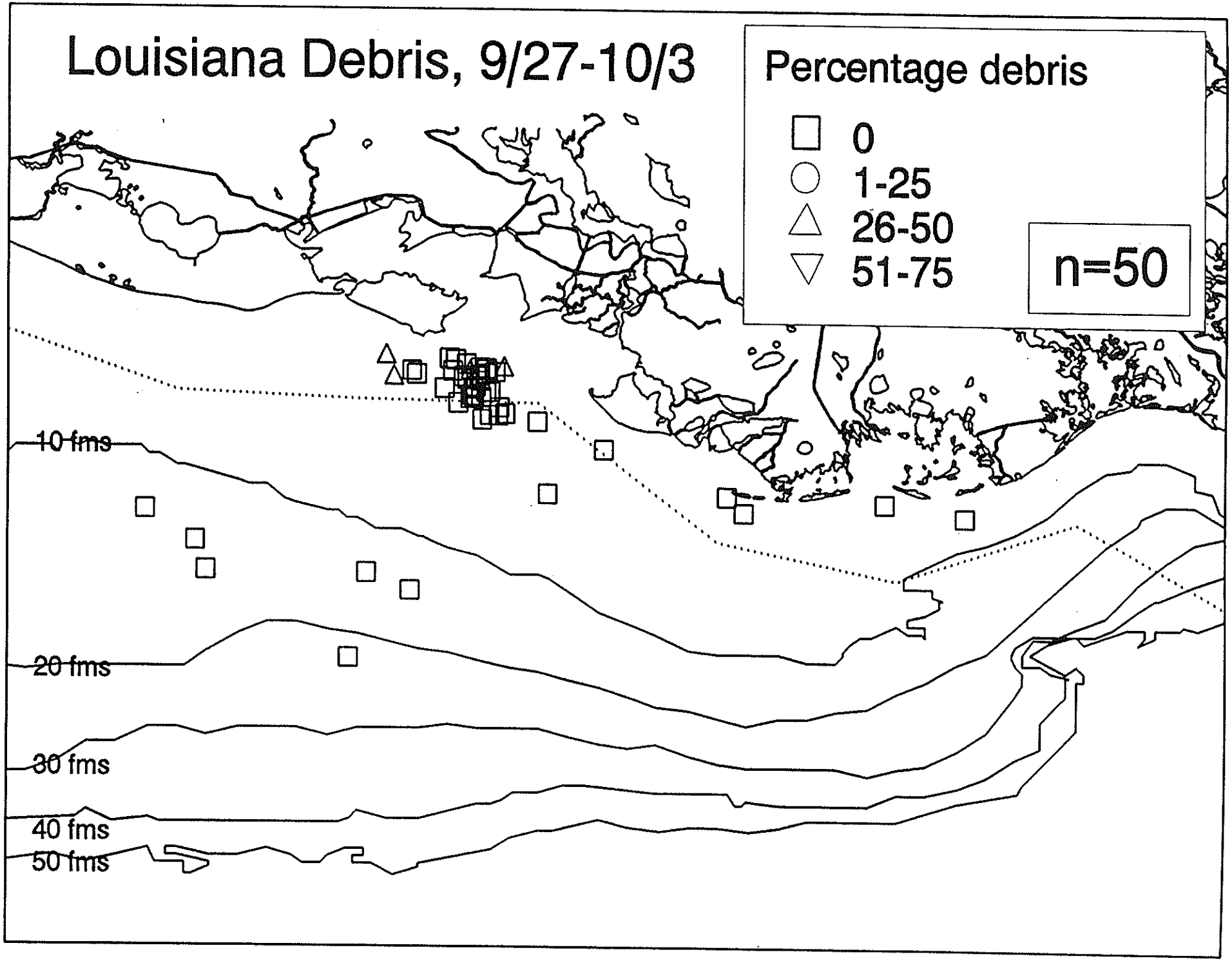
APPENDIX 1

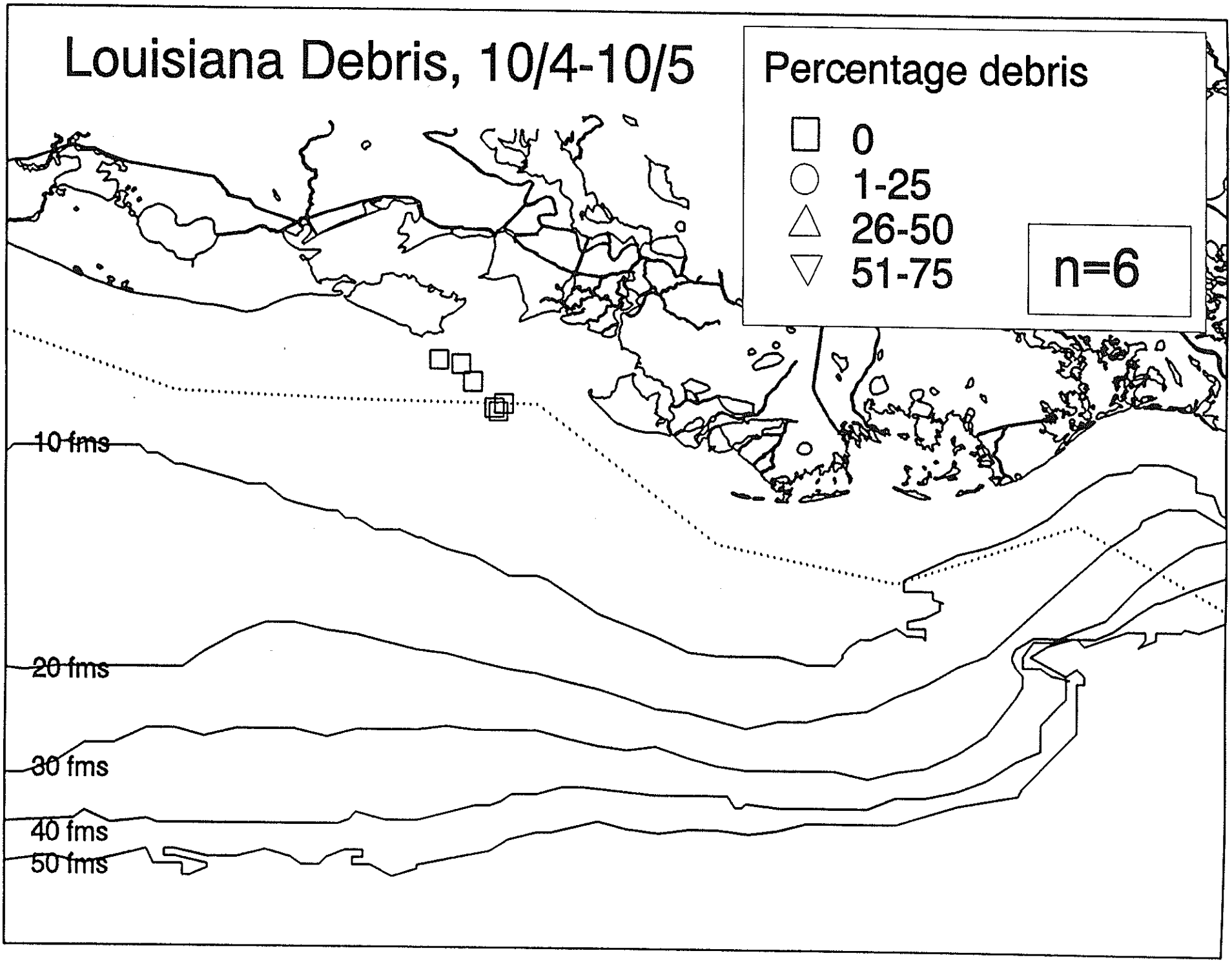
Weekly Maps of Tows

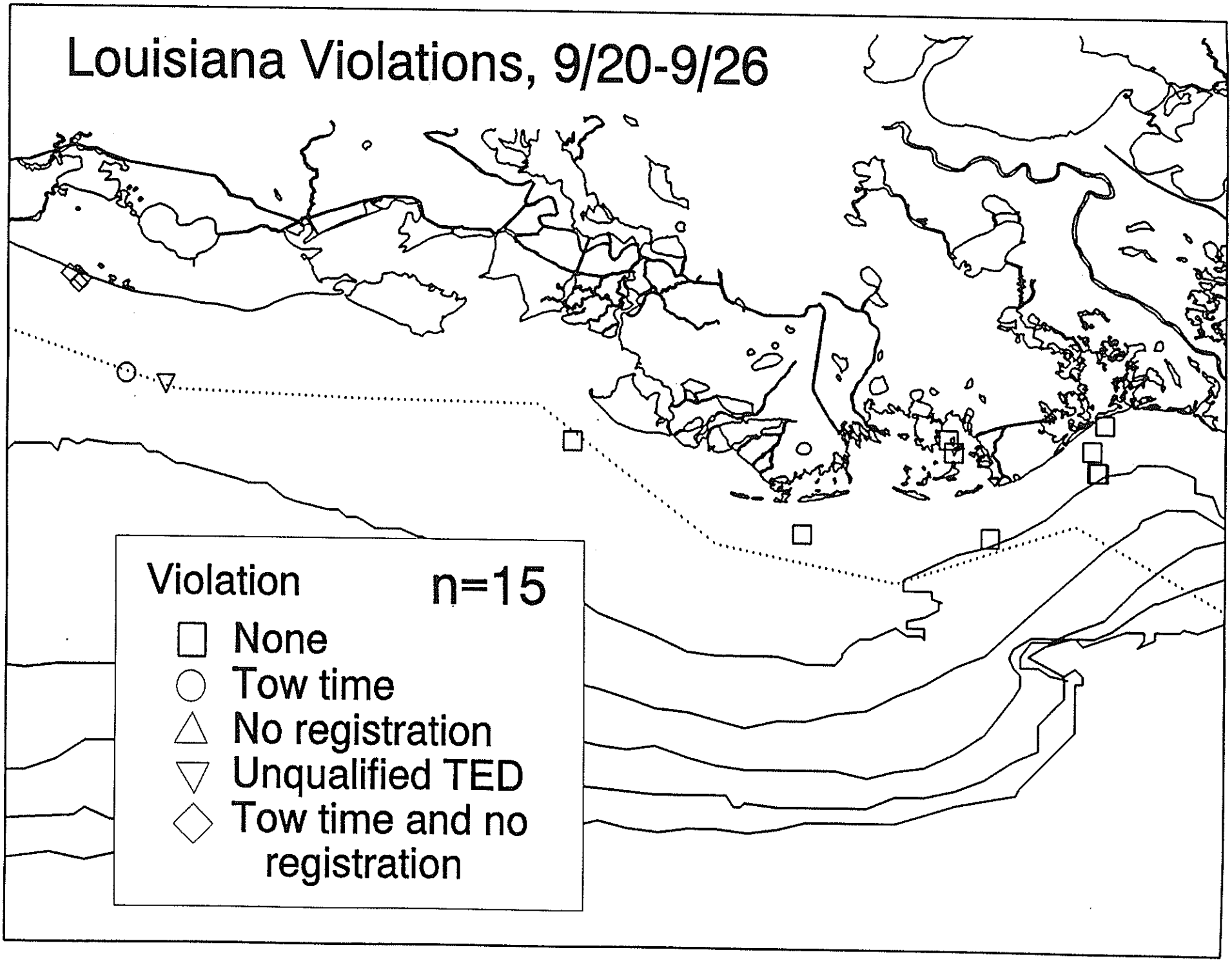

Louisiana Debris, 9/6-9/12
Percentage debris
0
1-25
26-50
51-75
n=11
10 fms
20 fms
30 fms
40 fms
50 fms


Louisiana Debris, 9/13-9/19
Percentage debris
0
1-25
26-50
51-75
n=22
10 fms
20 fms
30 fms
40 fms
50 fms


Louisiana Debris, 9/20-9/26
Percentage debris
0
1-25
26-50
51-75
n=61
10 fms
20 fms
30 fms
40 fms
50 fms


Louisiana Debris, 9/27-10/3
Percentage debris
0
1-25
26-50
51-75
n=50
10 fms
20 fms
30 fms
40 fms
50 fms


Louisiana Debris, 10/4-10/5
Percentage debris
0
1-25
26-50
51-75
n=6
10 fms
20 fms
30 fms
40 fms
50 fms


Louisiana Violations, 9/20-9/26
Violation
n=15
None
Tow time
No registration
Unqualified TED
Tow time and no registration